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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 65-50 ^{c.1}

**CONCENTRATION TESTS OF DRILL CORE
SAMPLES FROM MERRICAN INTERNATIONAL
MINES LTD., BURNABY ISLAND, B. C.**

by

G. W. RILEY

MINERAL PROCESSING DIVISION

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CONCENTRATION TESTS OF DRILL CORE SAMPLES FROM
MERRICAN INTERNATIONAL MINES LTD., BURNABY ISLAND, B.C.

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SUMMARY OF RESULTS

Of the seventeen drill core samples crushed to 10 mesh, only two samples produced magnetic concentrates containing more than 62% Fe, considered the minimum grade for Japanese steel mills. Crushing the magnetic concentrates to minus 28 mesh followed by wet magnetic concentration made some improvement in grade but at this size all of the concentrates were finer than 30% minus 100 mesh and would not meet Japanese size specifications for sinter feed.

Davis tube tests made on composite samples ground to minus 100 mesh and minus 200 mesh indicated that it would be necessary to grind finer than 100 mesh to obtain a grade of 62% Fe from the composite samples.

* Technical Officer, Mineral Processing Division, Mines Branch,
Department of Mines & Technical Surveys, Ottawa, Canada

INTRODUCTION

Shipment

Two shipments of drill core were received; one on September 18, 1964, consisted of 9 core samples, weight $9\frac{1}{2}$ lb, and another on October 22, 1964, of 8 core samples, weight $24\frac{1}{2}$ lb. The shipments were submitted by Mr. A.J. McClellan, General Manager, Merrican International Mines Ltd., 202-114 West, 15th Street, North Vancouver, B.C.

Location of Property

The property of Merrican International Mines Ltd. is located on Burnaby Island, Queen Charlotte Islands, B.C. Mr. A.J. McClellan stated that the property adjoins that of Mastodon-Highland Bell Mines Ltd. and is some two miles from Jedway Iron Ore Ltd.

Purpose of Investigation

Mr. McClellan stated in his letter of September 17, 1964, that the company is negotiating with Jedway and Highland Bell for a possible contract to process the ore and that Jedway stipulated that it must be amenable to treatment with their present mill equipment.

The investigation was to determine the grade of iron which could be recovered by magnetic separation. The magnetic concentrate specifications requested were: over 62% iron, and less than 30% minus 100 mesh material, to be acceptable by the present Japanese market.

Analysis

The chemical analyses, shown in this investigation, were made by the Chemical Analysis Section, Extraction Metallurgy Division, Mines Branch.

TABLE 1

Description of Samples

Sample	Drill Hole No.	Core Footage	Weight, grams
1	2	219-255	917
2	3	216-221	262
3	3	419-429	426
4	7	54-65	342
5	7	128-148	486
6	8	106-113	375
7	8	197-208	401
8	9	204-207	366
9	10	115-183	698
10	13	46-68	1178
11	13	68-88	1165
12	13	88-108	1522
13	13	108-124	1292
14	13	180-190	1185
15	13	200-210	1594
16	13	210-237	1909
17	13	194-215	1214

DETAILS OF INVESTIGATION

Test 1 - Dry Magnetic Concentration at Minus 10 Mesh

The core samples were crushed to minus 10 mesh, for dry magnetic concentration by a laboratory size Ball-Norton belt separator. The magnetic concentrates and non-magnetic tailings were assayed for total iron and the analysis of the feed was calculated. A screen test was made on each concentrate.

TABLE 2

Results of Magnetic Concentration at minus 10 mesh

SAMPLE 1

Product	Weight %	Analysis % Tot Fe	Distn % Tot Fe
Feed*	100.0	57.00	100.0
Mag conc	94.9	59.70	99.4
Tailing	5.1	6.87	0.6

* Calculated

continued....

TABLE 2 (continued)

Results of Magnetic Concentration at minus 10 mesh

SAMPLE 2

Product	Weight %	Analysis % Tot Fe	Distn % Tot Fe
Feed*	100.0	39.60	100.0
Mag conc	66.8	55.00	93.5
Tailing	33.2	7.81	6.5

SAMPLE 3

Feed*	100.0	58.00	100.0
Mag conc	90.8	62.90	98.5
Tailing	9.2	9.69	1.5

SAMPLE 4

Feed*	100.0	30.27	100.0
Mag conc	56.2	50.30	93.4
Tailing	43.8	4.56	6.6

SAMPLE 5

Feed*	100.0	57.26	100.0
Mag conc	91.2	62.10	98.9
Tailing	8.8	7.08	1.1

SAMPLE 6

Feed*	100.0	43.45	100.0
Mag conc	85.3	50.40	98.9
Tailing	14.7	3.13	1.1

SAMPLE 7

Feed*	100.0	32.00	100.0
Mag conc	56.7	46.50	82.4
Tailing	43.3	13.00	17.6

SAMPLE 8

Feed*	100.0	26.28	100.0
Mag conc	30.7	51.50	60.2
Tailing	69.3	15.10	39.8

* Calculated

continued....

TABLE 2 (continued)

Results of Magnetic Concentration at minus 10 mesh

SAMPLE 9

Product	Weight %	Analysis %	
		Tot Fe	Distn % Tot Fe
Feed*	100.0	47.35	100.0
Mag conc	88.3	52.90	98.7
Tailing	11.7	5.46	1.3

SAMPLE 10

Feed*	100.0	49.75	100.0
Mag conc	90.7	53.80	98.1
Tailing	9.3	10.20	1.9

SAMPLE 11

Feed*	100.0	50.55	100.0
Mag conc	87.0	57.40	98.8
Tailing	13.0	4.70	1.2

SAMPLE 12

Feed*	100.0	44.77	100.0
Mag conc	80.0	53.60	95.8
Tailing	20.0	9.45	4.2

SAMPLE 13

Feed*	100.0	39.10	100.0
Mag conc	67.6	50.20	86.8
Tailing	32.4	15.90	13.2

SAMPLE 14

Feed*	100.0	34.00	100.00
Mag conc	62.3	50.80	93.1
Tailing	37.7	6.22	6.9

SAMPLE 15

Feed*	100.0	49.20	100.0
Mag conc	91.6	52.90	98.5
Tailing	8.4	8.94	1.5

* Calculate

continued....

TABLE 2 (concluded)

Results of Magnetic Concentration at minus 10 mesh

SAMPLE 16

Product	Weight %	Analysis % Tot Fe	Distn % Tot Fe
Feed*	100.0	45.30	100.0
Mag conc**	77.4	55.26	94.4
Tailing	22.6	11.23	5.6

SAMPLE 17

Feed*	100.0	38.16	100.0
Mag conc	65.8	51.40	88.6
Tailing	34.2	12.70	11.4

* Calculated

** Calculated from Test 2, Table 4.

TABLE 3

Results of Screen Tests on the Magnetic Concentrates
at Minus 10 Mesh

Mesh	Weight %					
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
+ 10	0.3	0.4	0.6	0.6	0.2	0.6
- 10 + 14	8.3	13.2	14.3	12.2	10.0	11.3
- 14 + 20	16.3	21.5	22.2	20.8	19.4	20.2
- 20 + 28	14.5	18.4	17.5	17.9	16.6	16.6
- 28 + 35	11.6	12.6	11.5	12.3	11.9	11.4
- 35 + 48	8.3	7.4	7.9	8.4	7.7	7.3
- 48 + 65	7.1	5.4	6.4	6.5	6.6	5.6
- 65 + 100	6.3	4.4	5.1	4.9	6.2	5.4
-100	27.3	16.7	14.5	16.4	21.4	21.6
	100.0	100.0	100.0	100.0	100.0	100.0

continued....

TABLE 3 (concluded)

Results of Screen Tests on the Magnetic Concentrates
at Minus 10 Mesh

Mesh	Weight %					
	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
+ 10	0.5	0.5	0.3	0.4	0.2	0.4
- 10 + 14	13.2	9.8	9.2	11.1	8.7	6.8
- 14 + 20	21.4	17.4	17.7	10.0	9.9	9.2
- 20 + 28	17.1	14.5	15.8	13.7	13.6	14.9
- 28 + 35	11.7	11.0	12.2	12.8	13.9	14.7
- 35 + 48	7.5	7.6	7.9	8.6	9.3	9.5
- 48 + 65	5.4	6.7	6.3	7.1	7.8	7.5
- 65 + 100	4.5	5.9	5.3	6.0	6.8	6.2
-100	18.7	26.6	25.3	30.3	29.8	30.8
	100.0	100.0	100.0	100.0	100.0	100.0

Mesh	Weight %				
	Sample 13	Sample 14	Sample 15	Sample 16	Sample 17
+ 10	0.4	0.1	0.1	0.3	0.6
- 10 + 14	9.9	3.6	6.6	6.2	12.0
- 14 + 20	10.3	7.1	13.4	9.1	11.9
- 20 + 28	10.7	10.8	15.6	16.9	16.7
- 28 + 35	15.1	14.1	11.7	14.0	14.8
- 35 + 48	9.9	11.8	8.1	9.3	9.2
- 48 + 65	7.4	9.2	6.6	8.0	7.3
- 65 + 100	6.2	7.5	6.5	6.3	5.6
-100	30.1	36.0	31.4	29.9	21.9
	100.0	100.0	100.0	100.0	100.0

Test 2 - Wet Magnetic Concentration at Minus 28 Mesh

The magnetic concentrates from Test 1 were crushed to minus 28 mesh for wet magnetic concentration by a laboratory size Sala separator.

The magnetic concentrates were assayed for total iron and a screen test was made on each concentrate.

TABLE 4

Results of Magnetic Concentration at Minus 28 Mesh

SAMPLE 1

Product	Weight %		Analysis % Tot Fe	Distribution % Tot Fe	
	In test	In orig feed		In test	In orig feed
Feed	100.0	94.9	59.7	100.0	99.4
Mag Conc	81.6	77.4	60.9	83.3	82.8
Tailing*	18.4	17.5	54.2	16.7	16.9

SAMPLE 2

Feed	100.0	66.8	55.4	100.0	93.5
Mag Conc	93.0	62.1	57.6	96.7	90.4
Tailing*	7.0	4.7	26.1	3.3	3.1

SAMPLE 3

Feed	100.0	90.8	62.9	100.0	98.5
Mag Conc	96.5	87.6	63.0	96.6	95.2
Tailing*	3.5	3.2	61.1	3.4	3.3

SAMPLE 4

Feed	100.0	56.2	50.30	100.0	93.4
Mag Conc	88.5	49.7	54.60	96.1	89.8
Tailing*	11.5	6.5	17.06	3.9	3.6

SAMPLE 5

Feed	100.0	91.2	62.1	100.0	98.9
Mag Conc	96.3	87.8	63.1	97.8	96.7
Tailing*	3.7	3.4	36.9	2.2	2.2

SAMPLE 6

Feed	100.0	85.3	50.4	100.0	98.9
Mag Conc	92.4	78.8	53.3	97.7	96.6
Tailing*	7.6	6.5	15.3	2.3	2.3

SAMPLE 7

Feed	100.0	56.7	46.5	100.0	82.4
Mag Conc	90.8	51.5	50.3	98.2	80.9
Tailing*	9.2	5.2	9.1	1.8	1.5

* Calculated

continued....

TABLE 4 (continued)
Results of Magnetic Concentration at Minus 28 Mesh

SAMPLE 8

Product	Weight %		Analysis %	Distribution % Tot Fe	
	In test	In orig feed	Tot Fe	In test	In orig feed
Feed	100.0	30.7	51.5	100.0	60.2
Mag Conc	91.0	27.9	54.6	96.4	58.0
Tailing*	9.0	2.8	20.6	3.6	2.2

SAMPLE 9

Feed	100.0	88.3	52.9	100.0	98.7
Mag Conc	92.7	81.9	55.6	97.4	96.1
Tailing*	7.3	6.4	18.8	2.6	2.6

SAMPLE 10

Feed	100.0	90.7	53.8	100.0	98.1
Mag Conc	94.0	85.3	55.6	97.1	95.5
Tailing*	6.0	5.4	26.0	2.9	2.6

SAMPLE 11

Feed	100.0	87.0	57.4	100.0	98.8
Mag Conc	95.7	83.3	59.6	99.4	98.2
Tailing*	4.3	3.7	8.0	0.6	0.6

SAMPLE 12

Feed	100.0	80.0	53.6	100.0	95.8
Mag Conc	92.5	74.0	56.9	98.2	94.1
Tailing*	7.5	6.0	12.9	1.8	1.7

SAMPLE 13

Feed	100.0	67.6	50.2	100.0	86.8
Mag Conc	90.4	61.1	52.6	94.7	82.2
Tailing*	9.6	6.5	27.7	5.3	4.6

SAMPLE 14

Feed	100.0	62.3	50.8	100.0	93.1
Mag Conc	92.0	57.3	52.9	95.8	89.1
Tailing*	8.0	5.0	26.7	4.2	4.0

SAMPLE 15

Feed	100.0	91.6	52.9	100.0	98.5
Mag Conc	94.2	86.3	54.4	96.9	95.4
Tailing*	5.8	5.3	28.3	3.1	3.1

* Calculated

continued....

TABLE 4 (concluded)

Results of Magnetic Concentration at Minus 28 Mesh

SAMPLE 16

Product	Weight %		Analysis % Tot fe	Distribution % Tot Fe	
	In test	In orig feed		In test	In orig feed
Feed*	100.0	77.4	55.26	100.0	94.4
Mag Conc	94.2	72.9	57.91	98.7	93.2
Tailing	5.8	4.5	12.50	1.3	1.2

SAMPLE 17

Feed	100.0	65.8	51.4	100.0	88.6
Mag Conc	91.8	60.4	53.7	95.9	85.0
Tailing*	8.2	5.4	27.7	4.1	3.6

* Calculated

TABLE 5

Results of Screen Tests on the Magnetic Concentrates
at Minus 28 Mesh

Mesh	Weight %					
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
+ 35	17.7	24.6	10.0	16.2	12.1	12.0
- 35 + 48	19.2	18.3	22.3	15.8	20.2	21.4
- 48 + 65	12.9	12.5	17.3	11.7	15.0	14.5
- 65 + 100	10.6	9.6	12.8	9.4	11.5	11.6
-100	39.6	35.0	37.6	46.9	41.2	40.5
	100.0	100.0	100.0	100.0	100.0	100.0

Mesh	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
+ 35	18.5	8.9	11.2	15.4	16.8	13.2
- 35 + 48	20.4	10.9	14.2	17.8	18.8	15.4
- 48 + 65	12.3	15.0	14.3	13.5	12.6	11.9
- 65 + 100	9.7	15.0	11.5	10.4	10.1	12.0
-100	39.1	50.2	48.8	42.9	41.7	47.5
	100.0	100.0	100.0	100.0	100.0	100.0

Mesh	Sample 13	Sample 14	Sample 15	Sample 16	Sample 17
+ 35	18.6	17.1	16.2	16.7	17.4
- 35 + 48	20.0	18.1	18.1	18.8	22.5
- 48 + 65	13.0	13.1	12.2	13.9	15.8
- 65 + 100	9.9	10.2	10.3	10.2	10.5
-100	38.5	41.5	43.2	40.4	33.8
	100.0	100.0	100.0	100.0	100.0

Test 3

Three composite samples were made from the magnetic concentrates of the minus 28 mesh Sala tests by combining the concentrates from samples 1, 3, and 5; 2, 4, 6, 7, 8, and 9; and, 10, 11, 12, 13, 14, 15, 16, and 17. One portion of each composite sample was ground to minus 100 mesh and another to minus 200 mesh. Each sample was concentrated by a Davis tube and concentrates assayed for Tot Fe.

TABLE 6

Results of Davis Tube Tests on Minus 28
Sala Magnetic Conc Ground to Minus 100 Mesh and 200 Mesh.

Composite Sample	% Tot Fe	
	-100 mesh	-200 mesh
1, 3 & 5	66.8	67.1
2, 4, 6, 7, 8 & 9,	61.8	65.3
10, 11, 12, 13, 14, 15, 16 & 17	61.9	63.7

TABLE 7

Chemical Analyses of the Davis Tube Minus 100 Mesh
Magnetic Concentrates

Composite Sample	Analysis %				
	Tot Fe	SiO ₂	P	S	Ti
1, 3 & 5	66.8	5.26	0.025	0.1	0.22
2, 4, 6, 7, 8 & 9	61.8	8.82	0.031	0.1	0.28
10, 11, 12, 13, 14, 15, 16 & 17	61.9	6.40	0.034	0.1	0.25

CONCLUSIONS

Results of the tests on core samples crushed to minus 10 mesh showed that only samples 3 and 5 produced concentrates above the minimum grade of 62% Fe and crushing to minus 28 mesh gave only a slight improvement in grade.

Grinding of composite samples of below grade magnetic concentrates to minus 100 mesh gave concentrates still below the required grade. Concentrates above 62% Fe were produced only after grinding to minus 200 mesh. The Davis tube concentrates contained tolerable levels of P, SiO₂ and TiO₂.

Present size specifications were met when samples were crushed to minus 10 mesh, however, concentrates were too fine at minus 28 mesh.

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